

ABSTRACT

A new relatively high-k gate dielectric gate material comprising calcium oxide will reduce leakage from the silicon substrate to the polysilicon gate, prevent boron penetration in p-channel devices, and reduce electron trapping in the dielectric. The surface of a silicon wafer is
130 saturated with hydroxyl groups. A calcium halide, preferably calcium bromide, is heated to a temperature sufficient to achieve atomic layer deposition, and is transported to the silicon wafer. The calcium halide reacts with the hydroxyl groups. Water is added to carry away the resultant hydrogen halide. Gaseous calcium and water are then added to form a calcium oxide gate dielectric, until the desired thickness has been achieved. In an alternative embodiment of the
135 method, the calcium halide is transported to the silicon wafer to react with the hydroxyl groups, followed by transport of gaseous water to the silicon wafer. These two steps are repeated until the desired thickness has been achieved.